of parental alcoholism on the progeny in poultry. The additional data make still more certain the conclusions, first, that the progeny of alcoholized parentage (in poultry) while fewer in numbers is made up of individuals superior in physiological vigor, and, second, that this result is due to a selective action of the alcohol upon the germ cells.

[1] Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 105.

[2] Pearl, R., *Proc. Nat. Acad. Sci.*, 2, 380–384 (1916). *Cf.* also for a fuller statement of the results *Proc. Amer. Phil. Soc.*, 55, 243–258 (1916). The complete report on the earlier stages of the work is in press in *J. Exper. Zool.*

[3] This term is defined in my former papers as "the total number of days during which the two gametes making the offspring zygote have been exposed to alcoholic influence while sojourning in the body of the treated individuals."

[4] For summary and bibliography of earlier papers see Stockard, C. R., and Papanicolaou, G., A further analysis of the heredity transmission of degeneracy and deformities by the descendants of alcoholized mammals, *Amer. Nat.*, 50, 65–88, 144–177 (1916).

[5] Tyson, H. H., and Schoenberg, M. J., Experimental researches in methyl alcohol inhalation, *J. Amer. Med. Assoc.*, 63, 915–922 (1914).

[6] Poincaré, L., Sur les dangers de l'emploi de l'alcool methylique dans l'industrie, *Paris, C. R. Acad. Sci.*, 87, 682–683 (1878).

[7] Cf. for example Völtz, W., and Baudrexel, A., Ueber die vom tierischen Organismus unter verschiedenen Bedingungen ausgeschiedenen Alkoholmengen. II. Mitth., *Pflügers Arch.*, 142, 47–88 (1911); and other papers in the same series. Also note similar data in Völtz, W., Förster, R., and Baudrexel, A., Ueber die Verwertung des Bierextraktes und des Bieres im menschlichen und tierischen Organismus. *Ibid.*, 134, 133–258 (1910).

[8] Cf. Ivanov, J., Action de l'alcool sur les spermatozoïdes des mammifères (Première communication), *C. R. Soc. Biol., Paris*, 74, 480–482 (1913).

AN IONIZATION MANOMETER

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Heretofore the only manometers available for measuring extreme vacua have been the Knudsen manometer and the Langmuir molecular gauge. Both of these have serious disadvantages due to their delicate construction and slowness of action. A new manometer free from these objections and with a greater range of presssure than either has been developed. This manometer makes use of the ionization of gas by an electron discharge.

The manometer consists of three electrodes sealed in a glass bulb which serve as cathode, anode, and collector of positive ions. The cathode may be any source of pure electron discharge such as a Wehnelt cathode or a heated tungsten or other metallic filament. The exact forms of the electrodes are not of great importance. The collector is

preferably situated between the other two electrodes and of such form as not to entirely block the electron current to the anode. A milliammeter is used to measure the current to the anode and a sensitive galvanometer to measure the current from the collector which is maintained negative with respect to the cathode so as to pick up only the positive ions.

If there were no gas at all in the space between the electrodes a pure electron current would flow from cathode to anode and no current would flow to the collector. However, if gas is present positive ions are formed by collision in amount proportional to the electron current and the number of gas molecules in the space. Since the collector is negative with respect to the cathode a certain proportion of the positive ions, depending on the form, dimensions, and potentials of the electrodes, will flow to the collector. Hence the ratio of the collector current to the anode current is proportional to the pressure and may be used to measure the pressure when the constant of proportionality has been determined.

This relation has been tested experimentally with air over a pressure range from 10^{-3} to 4×10^{-6} mm. of mercury by comparison with McLeod and Knudsen manometers. The actual apparatus used consisted of a glass bulb 6 cm. in diameter enclosing three parallel, V shaped filaments of thin platinum strip, each about 3.5 cm. long, placed 5 mm. apart, the collector being between the other two. Leads from both ends of each filament were brought through the glass. This arrangement permits glowing the electrodes to free them from occluded gases. An oxide coated filament was used for the cathode. The bulb was sealed to a large glass reservoir which was connected to a high vacuum pump and either the Knudsen or McLeod manometers. When the latter was used a liquid-air trap served to keep the mercury vapor of the McLeod manometer out of the ionization manometer.

Currents from 0.2 to 2.0 milliamperes were used with from 100 to 250 volts between cathode and anode. The collector was held at 10 volts negative with respect to the cathode. The resulting current to the collector at a pressure of 10^{-3} mm. was about one-thousandth the current to the anode and at lower pressures was proportionately less. Hence at a pressure of 10^{-6} mm. with a current of 2.0 milliamperes to the anode a collector current of 2×10^{-9} amperes could be obtained. With a sensitive galvanometer much lower pressures could easily be measured.

Experiments with hydrogen and with mercury vapor in place of air gave constants of proportionality nearly the same as with air.

The advantages of this type of manometer are readily apparent. Its range compared to that of other high vacuum gauges is very large, extending from more than 10^{-3} mm. to as low pressures as can be obtained, without any change of apparatus. On account of its simplicity of construction it is inexpensive and exactly reproducible. Since there are no moving parts there are no difficulties due to vibration. The pressures of vapors which would not be registered on the McLeod gauge are measured by the ionization manometer. One of the greatest advantages is the rapidity and ease with which measurements of a varying pressure may be made since only the reading of a galvanometer need be followed.

Many applications for which other manometers cannot readily be used at once suggest themselves, such as the measurement of vapor pressures of metals, etc. Since the device may be made with extremely small volume the pressure of very small quantities of gas may be measured. It would also be useful to measure pressure changes over a long period of time for which more expensive manometers could not well be employed.

A number of interesting physical measurements other than the measurement of pressure can be made with devices operating on the principle of this manometer, among which is that of the removal of occluded gases by electron bombardment. It is also hoped that experiments with various gases will give some information as to the relative cross sectional areas which different kinds of molecules present to the electron discharge, for although the constant of the manometer was found approximately the same for hydrogen, air, and mercury vapor, more exact measurements might show differences due to different molecular diameters.

PHYSIOLOGICAL STUDIES ON RHIZOPHORA

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Research on the physiology and ecology of the red mangrove, *Rhizophora mangle*, which has engaged my attention for the past few years, was continued at the Tortugas Laboratory of the Carnegie Institution during the summer of 1916. The phase of physiologic investigation most emphasized was that relating to the transpiration rate of *Rhizophora* seedlings grown in solutions of different concentrations of salt